



Figure 1: Simulated gluon polarization effects for a measurement and analysis of A_{LL} for γ -jet coincidences with the STAR detector at $\sqrt{s}=200 \text{ GeV}$ and 500 GeV . In order to illustrate the sensitivities, results are plotted vs. the x_{gluon} values reconstructed event-by-event from the coincidence kinematics, under the simplifying assumption of a collinear quark-gluon collision. Upper panels show the distribution of events and the projected pp A_{LL} values based on a particular parameterization (set A in [?]) of $\Delta g(x)$, with statistical errors only. The lower panels show gluon helicity preferences reconstructed from a LO analysis for three different input gluon pdf's [?], plus fits demonstrating consistency of the extracted and input gluon polarizations. 200 (500) GeV data are needed to constrain the shape of $x\Delta g(x)$ above (below) its anticipated maximum. The net gluon contribution to the proton spin is represented by the area under the $x\Delta g(x)$ curve, from $x = 0$ to $x = 1$. With the integrated recorded luminosities assumed in this document, updated analysis cuts, and inclusion of updated γ reconstruction efficiencies and subtraction of residual π^0 background, the measurement uncertainties would be a factor ~ 2 larger than those shown, while the peaks of the x -range probed would shift downward by $\sim 25\%$.